

WHAT WE CLAIM AS OUR INVENTION:

1. An extrusion head assembly for a vertical rotary blow molding machine using molds having radially inner and radially outer mold cavities; the assembly comprising a body; a first extrusion head in the body, the first extrusion head having a first head annular flow passage and a first head mouth opening in the direction of rotation of the wheel for extruding a first parison for capture in inner mold cavities; a second extrusion head in the body, the second extrusion head having a second head annular flow passage and a second head mouth opening in the direction of rotation of the wheel for extruding a second parison for capture in outer mold cavities, the second extrusion head located outwardly of the first extrusion head; a first resin passage in said body, said first resin passage extending from an inlet end into the body, past the second head flow passage, and to the first head flow passage; and a second resin passage in said body, said second resin passage extending from an inlet end into the body and to the second head flow passage.

2. The assembly as in claim 1 wherein said resin passages are at different heights.

3. The assembly as in claim 1 wherein the first head mouth is above the second head mouth; and said first resin passage is above said second resin passage.

4. The assembly as in claim 1 wherein said first and said second resin passages are each located entirely in said body.

5. The assembly as in claim 1 including a third resin passage in said body, said third resin passage extending from an

inlet end into the body, past the second head flow passage and to the first head flow passage.

6. The assembly as in claim 5 including a fourth resin passage in said body, said fourth resin passage extending from an inlet end into the body and to the second head flow passage.

7. The assembly as in claim 6 wherein said first and third resin passages join the first head flow passage at first and second head ports, such ports spaced apart around such flow passage; and said second and fourth resin passages join the second head flow passage at third and fourth head ports, such ports spaced apart around such flow passage.

8. The assembly as in claim 6 wherein said first and third resin passages are located at a first height; and said second and fourth resin passages are located at a second height different from said first height.

9. The assembly as in claim 6 including a manifold on said body outwardly of said second head, the manifold including a first inlet port for flowing resin to the first extrusion head, a second inlet port for flowing resin to the second extrusion head, a first branched manifold passage extending from the first inlet port to the inlet ends of the first and third resin passages; and a second branched passage extending from the second inlet port to the inlet ends of the second and fourth resin passages; wherein resin supplied to the first inlet port is flowed through the first branched passage and the first and third resin passages to the first head flow passage, and resin supplied to the second inlet

port flows through the second branched passage and said second and fourth resin passages to second head flow passage.

10. The assembly as in claim 9 wherein said first and third resin passages are above said second and fourth resin passages.

11. The assembly as in claim 9 wherein said manifold includes a manifold surface facing away from said extrusion heads, said inlet ports located on said manifold surface.

12. The assembly as in claim 1 including a resin extruder; a first flow conduit connecting the extruder to the first resin passage; a second flow conduit connecting the extruder to the second resin passage; a first melt pump located in said first flow conduit; and a second melt pump located in said second flow conduit; wherein said melt pumps isolate the resin pressure in each flow conduit from the pressure in the other flow conduit and from the pressure in the extruder.

13. The assembly as in claim 1 wherein the first head mouth is located above the second head mouth.

14. The assembly as in claim 1 wherein each extrusion head comprises a coextrusion head.

15. The assembly as in claim 14 wherein the first head mouth is located above the second head mouth.

16. The assembly as in claim 15 wherein the first resin passage is located above the second resin passage.

17. The assembly as in claim 14 wherein each coextrusion head includes a plurality of nested conical bushings.

18. The assembly as in claim 17 wherein each bushing has the same height.

19. The assembly as in claim 17 wherein each coextrusion head includes a mandrel, a die ring on the top bushing, and a die pin located within said ring, the pin and ring of each head defining the size of the mouth for the head; a control cylinder located below the mandrel, a die rod joined to said die pin and extending through the mandrel to the control cylinder; the first head mouth located above the second head mouth; and the die rod of the second head being longer than the die rod of the first head, wherein said control cylinders are located at the same level.

20. The assembly as in claim 1 wherein said inlet ends are located out of the path of movement of the molds.

21. The assembly as in claim 1 wherein said resin passages are in said heads.

22. A coextrusion head assembly for a vertical rotary blow molding machine using a plurality of molds each having a radially inner mold cavity and a radially outer mold cavity; the assembly comprising a body; a first coextrusion head in the body, the first extrusion head including a first head annular flow passage and a first head extrusion mouth for extruding a first multi-layer parison for capture in inner mold cavities; a second coextrusion head in the body, the second coextrusion head located outwardly of the first coextrusion head and including a second head annular flow passage and a second extrusion mouth for extruding a second multi-layer parison for capture in outer mold cavities; a first resin passage for each layer in the first multi-layer parison, said first resin passages each including an inlet end and extending from such end through the body, past the second extrusion head and to the

first head flow passage; and a second resin passage for each layer in the second multi-layer parison, said second resin flow passages each including an inlet and extending from such end through the body to said second head flow passage.

23. The assembly as in claim 22 wherein all said passages are in said heads.

24. The assembly as in claim 22 wherein the second head extrusion mouth is located above the first head extrusion mouth.

25. The assembly as in claim 24 wherein each coextrusion head extrudes a parison having the same number of resin layers; and the resin passage supplying resin for one layer in the first coextrusion head is located above the resin passage supplying resin to a corresponding layer in the second coextrusion head.

26. The assembly as in claim 22 wherein all said inlet ends are located out of the path of movement of the molds.

27. The assembly as in claim 22 wherein each coextrusion head includes a pair of 180 degree-opposed head inlet ports for each parison layer; and said first resin flow passages extend past the second head flow passage and to each first head inlet port; and said second resin flow passages extend to each second head inlet port.

28. The assembly as in claim 27 wherein said first resin flow passages extend past opposite sides of said second head flow passage.

29. The assembly as in claim 27 including a manifold on said body, the manifold including a plurality of first manifold inlet ports and a first branched manifold passage connecting each first

manifold inlet port to two first resin flow passages; and a plurality of second manifold inlet ports and a second branched manifold passage connecting each second manifold inlet port to the two second resin flow passages.

30. The assembly as in claim 29 wherein the first manifold inlet ports are located in a row and the second manifold inlet ports are located in a row.

31. The assembly as in claim 22 wherein each coextrusion head includes a mandrel and a plurality of nested conical bushings surrounding the mandrel for flowing resin layers onto the mandrel; said mandrels and bushings in each head being identical.

32. The assembly as in claim 22 including a resin extruder; a first melt conduit extending from the resin extruder to one of said first resin flow passages; a second melt conduit extending from the extruder to one of said of second resin flow passages; and two melt pumps, each melt pump located in one of said melt conduits.

33. The method of blow molding articles in a rotary blow molding machine having a plurality of like dual cavity molds each defining a radially inner cavity and a radially outer cavity; a wheel supporting the molds; a drive for rotating the wheel; a drive for closing the molds to capture a parison in each mold cavity and for opening the molds to eject blow molded articles; and an extrusion assembly having a body, radially inner and radially outer extrusion heads in the body, each extrusion head including an annular flow passage and a flow mouth, the heads extruding inner and outer parisons for capture in the radially inner and radially

outer cavities when the molds are closed on the parisons, and a source of resin to be extruded; comprising the steps of:

A) flowing resin from the source along a first resin passage in the body extending past the radially outer extrusion head and to an inlet port for the radially inner extrusion head for extrusion in the inner parison;

B) flowing resin from the source along a second resin passage in the body extending to an inlet port for the radially outer extrusion head for extrusion in the outer parison;

C) rotating successive open molds past the sides of said inner and outer heads and to either side of the inner and outer parisons;

D) closing successive open molds on the inner and outer parisons to capture portions of said parisons in the radially inner and radially outer cavities;

E) blowing the parisons in the cavities to form blow molded articles; and

F) opening the molds and ejecting the blow molded articles.

34. The method of claim 33 including the step of:

G) flowing resin for the inner extrusion head past one side of the flow passage for the outer extrusion head.

35. The method of claim 33 including the step of:

H) flowing resin for the radially inner extrusion head past opposite sides of the flow passage for the radially outer extrusion head.

36. The method of claim 33 including the steps of:

I) flowing resin to the radially inner head through spaced inlet ports; and

J) flowing resin to the radially outer extrusion head through spaced head inlet ports.

37. The method of claim 33 including the steps of:

L) flowing a plurality of different resins to each extrusion head; and

M) extruding a multi-layer parison from each extrusion head.